

REMARKS

The July 19, 2005 Office Action was based upon pending Claims 1-10 and 23-33. The amendment cancels withdrawn Claims 11-22. Thus, after entry of this amendment, Claims 1-10 and 23-33 are pending and presented for further consideration.

In the July 19, 2005 Office Action, the Examiner continues to reject Claims 1-10 and 23-33. Reconsideration of the pending claims, is respectfully requested. As set forth below, Applicants submit that the rejections are based upon a factual misunderstanding of the prior art.

REJECTION OF CLAIMS 1-10 AND 23-33 UNDER 35 U.S.C. §103(a)

The Examiner rejected Claims 1-10 and 23-33 under 35 U.S.C. 103(a) as being obvious over European patent No. 854505 A2 to Lu et al. ("Lu") in view of U.S. Patent No. 5,364,803 to Lur et al. ("Lur").

Claims 1 and 23

Applicants respectfully traverse the rejections and submit that Lu in combination with Lur does not teach the recited structure. Each of independent Claims 1 and 23 recite a structure in which polysilicon intervenes between titanium boronitride and a conductive layer that has at least some fluorine atoms (i.e., conductive layer over polysilicon over TiB_xN_y over gate oxide). In contrast, Lu teaches an embodiment in which TiN_xB_y intervenes directly between a gate insulator 5 and a tungsten gate structure 14 that does not have any polysilicon.

Lu teaches two positions for TiN_xB_y in a gate stack. The first position is not relevant to the present claims, and is a diffusion barrier between tungsten and polysilicon. The second position, which is more relevant to the present claims, is TiB_xN_y directly over a gate insulator 5. However, this embodiment is limited to direct contact between the TiN_xB_y layer and tungsten. This will be clear from the following quotation:

In addition, an adhesion promoter is needed in a tungsten-based gate structure so as to better adhere the tungsten layer to the gate insulator 5. More specifically, the TiN , $TiSi_xN_y$, or TiN_xB_y layers, which are formed using the

described embodiments, would be used between the polysilicon portion of the gate structure 14 and the overlying tungsten portion of gate 14 or it would be used between gate insulator 5 (preferably an oxide, nitride, or a combination thereof) and gate structure 14 which is preferably comprised of tungsten.

Page 4 at lines 30-37 (emphasis added).

As will be clear to the skilled artisan, Lu is motivated to use a titanium boronitride layer either (1) as a diffusion barrier between polysilicon and tungsten; or (2) as an adhesion layer between and directly contacting a gate insulator 5 and tungsten. Embodiment (1) does not relate to the TiB_xN_y position recited in the present claims. Embodiment (2) is limited to gate stacks with tungsten directly over TiB_xN_y over gate insulator, without intervening polysilicon, in order to improve the adhesion between tungsten and gate insulator 5. Accordingly, for this embodiment there is no motivation to employ an intervening polysilicon between the titanium boronitride layer and the tungsten layer, contrary to the recitations in the pending claims.

Thus, the primary reference Lu does not teach the use of titanium boronitride between a polysilicon layer and a gate oxide layer. The secondary reference Lur is cited for its teaching of fluorine atoms and does not teach or suggest a barrier layer of titanium boronitride between a gate dielectric and polysilicon, and so does not make up for the deficiency of Lu. Accordingly, Applicants respectfully submit that the asserted combination does not teach or suggest the recited structures of independent Claims 1 or 23.

Accordingly, Applicants submit that the rejections for obviousness of these independent claims are overcome.

Claims 2-10 and 24-33

Claims 2-10 and 24-33, which depend from Claims 1 and 23, respectively, are believed to be patentable for the same reasons articulated above with respect to Claims 1 and 23, respectively, and because of the additional features recited therein.

Appl. No. 10/687,086
Filed : October 16, 2003

CONCLUSION

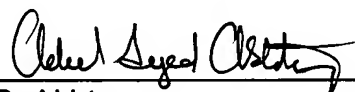
Applicants have endeavored to address all of the Examiner's concerns as expressed in the Outstanding Office Action. In light of the above remarks, reconsideration and withdrawal of the outstanding rejections is specifically requested.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: September 19, 2005

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